

# OMRON

# Smart Sensors ZS Series

2D CMOS Laser Type

### High-precision Displacement Measurement Sensors Bringing Smart Sensors into New Fields.





### **ZS-HL** Series

More P.6

# Very High-performance Sensors that Support Core Quality from Very Long-range to Extremely Precise Measurements

Range of models with measuring center distance of 20 to 1,500 mm.

- •Achieves maximum resolution of 0.25  $\mu$ m.
- $\blacksquare$  Maximum response speed of 110  $\mu s.$
- Parallel output supported.



# Highly Advanced Sensing Fu



Advanced technology is carried

# nctions in a Compact Package

Rueineee card eize

#### • OMRON USB OMPOR 25-HUR Monitor Manipulate Sensor Controllers ZS-HLDC/LDC **SmartMonitor** Enable maximum sensing performance with fully digital Professional ZS-SW11E V3 processing. Setting Software for the ZS Series Culmination of OMRON's lead-edge digital technology. Enables easy utilization of the ultimate in measurement performance. Meets a wide range of logging needs. Supports high-speed simultaneous multichannel waveform Business card size graphs. USB provided as a standard feature. Excel macros provided for simple analysis. More P.12 More P.19



### Main Applications

**ZS-HL Series** 

### High Performance Very High-performance Sensors that Support Core Quality from Very Long-range to **Extremely Precise Measurements**



ZS-LD10GT/LD15GT

Ideal for measuring Ideal for measuring and controlling the thickness of silidispenser nozzle gaps cone or compound when applying sealer. semiconductor wafers in polishing and testing

processes.

**ZS-LD40T** 

Ideal for measuring glass

gaps when coating glass

thickness and nozzle

with resist or sealer.

#### **ZS-HLDS2T ZS-HLDS2VT**



Ideal for measuring the potting resin height for electronic components.

Including Spot Detection, Wide-range Detection, and Long-distance Detection

Ideal for measuring liquid gasket (FPIG) application amounts. Prevents defects such

as insufficient seal

**ZS-HLDS5T** 



**ZS-HLDS10** 

Ideal for level positioning and detection for liquid repeatability accuracy crystal coaters and of XY stages. PDP fluorescent substances.

ZS-HLDS150



Protruding objects and steps can be measured from a distance for measurement objects that cannot be accessed easily.

Standard **ZS-L** Series



#### **ZS-LD20ST**



Ideal for measurements requiring discrimination between minute parts or fine shape repeatability.

#### **ZS-LD50/LD80**



Standard Sensors Ideal for a Variety of High-precision Displacement Measurements,

Ideal for measuring the warp of resin blades in copy machine toners.

#### **ZS-LD200**



Ideal for checking the precision of door installations.





**ZS-HLDS60** 

Ideal for checking the flatness of robot arms that transport wafers in load ports.



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### Applications by Industry

#### Automobile and Automotive Parts







#### Semiconductors







#### LCDs and PDPs







#### **Electronic Components**







#### Household Appliances and Audio-visual







#### Rubber, Resin, and Film







### ZS-HL Series Product Lineup 2D CMOS High-end Displacement Sensors

Advanced sensing technology packed into the best Sensor Head for the highest sensing precision



Advanced technology is carried

### All Models Are Class 2 Lasers.

#### **Digital Sensing**

Totally reliable measurements with completely digital sensing.



#### 2D CMOS Laser Image Sensing Element

The three basics of sensing precision, speed, and sensitivity - can be balanced because ideal measurement settings can be made for light reception area.

**Extremely Sensitive Lenses** 



### **Extreme Stability**

#### Ideal Size and Stability Head Size

Complete sensing stability with optimum Sensor Head size for best performance and holding mechanism secured at 3 points. (See note.)



ZS-HLDS2T ZS-HLDS5T/ HLDS10

Note: ZS-HLDS2T not applicable

ZS-HLDS60/HLDS150

## Superior Moving Resolution

Moving resolution (error based on workpiece surface position) has been reduced dramatically by optimizing the optical system with increased sensitivity and resolution of the light receiving lenses.



# Reduced Error for Different Materials 2D CMOS

workpieces inline.

With a CCD, the charge overflows to the next pixel when excessive light is received. This phenomenon does not occur with CMOS, so there are no effects from light fluctuations from different materials or excessive light reception.



### **ZS-HLDS5T/HLDS10** Detect Essentially Any Object

Reduced Variation in Linearity between Different Objects, and Linearity Determines Measurement Accuracy. Makes it easier to introduce a variety of detection objects.



### **ZS-HLDS60/HLDS150** A Long Range That Handles Essentially Any Installation Site





60 Simple Long-distance Step Measurement





Peak/bottom measurement



widths of each car model.



### **ZS-HLDS2VT** *NEW* Ideal for Measuring the Height and Thickness of Transparent Objects

Tilted and moving workpieces can also be stably measured.



A special aspherical lens was developed for the ZS-HLDS2VT, and the design of the optical structure was optimized for regular-reflective workpieces. This has greatly increased the allowable degree of tilt and improved stability for measuring transparent and regularreflective workpieces.

#### Angle Characteristics





Aspherical lens (newly developed)

High-performance Sensor

### **ZS-HLDS2T/ZS-LD10GT/LD15GT** The Only Way to Very High-precision Measurements

Superior Features for Semiconductor Wafer, Glass, and Other Measurements Requiring Precision

Slim 26.4 mm			Simultaneous Measuring of Touch Panel Fi	Im Thickness and Gap	
	Model	ZS-HLDS2T		100 95 90 90 85 80 75 90 90 90 90 90 90 90 90 90 90	
	Measuring center distance	20±1 mm		F 70 100	
and the second	Resolution	0.25 μm	Thickness		
	Linearity	±0.05%F.S.	Film	0 0.2 0.2 0.4 0.6 0.8 1 (	) 0.2 0.4 0.6 0.8 1 Travel distance (mm)
	Beam shape	$20 \ \mu m  imes 1 \ mm$	Glass Glass		
THE R. LEWIS CO., Name				Simultaneous measurement of transparent object thickne	ess and gap

An unbelievable stationary measurement precision of 0.25  $\mu$ m, the highest in this product class.



Model	ZS-LD10GT/LD15GT	
Measuring center distance	10±0.5 mm/15±0.75 mm	
Resolution	0.25 μm	
Linearity	±0.1%F.S.	
Beam shape	$25 imes 900~\mu m$	

Ideal for Measuring Nozzle Gaps!

- Reduced pattern influence for moving measurement, the best in the moving resolution industry.
- Possible to match nozzle drip point and measurement point then measure.
- Sensor Head with separate light emission and reception in one unit to create nozzle space.

Nozzle Gap Sensor



Sealant supply nozzle

Height Control of Sealant Dispensers Inspection of Disk Play on HDD Motor Rotating Plate





Measures amplitude undulations of 5  $\mu$ m.

### **Technology**

simultaneous measurement of front and back

glass surfaces with separate sensitivities.

With OMRON's sensing technology and newly developed algorithms, stable, high-precision measurement is possible of workpieces that were difficult to measure using laser displacement meters due to laser light penetration, transmission, excessive reflection, or insufficient light.



which facilitates super high resolution.

High-performance Sensors

Enables maximum sensing performance with fully digital processing and multitasking functions.

A controller the size of a business card filled with OMRON's leading-edge digital technology. Enables easy utilization of the ultimate in measurement performance.



#### **Outline of Functions**



#### High-performance Sensing (Multitasking)



Simultaneous Control in 2 Systems of Data Confirmation and Analysis and Data Collection, Control, and Changeovers



Improved Total Cycle Time with 1-second High-speed Bank Switching



Advanced technology is carried

#### Easy Sensing with an HMI That Couldn't Be Easier to Use (Common Functions)

#### Information at the Touch of a Button

In RUN (measurement) Mode, measured values and information are displayed using 2 rows of 8-segment LEDs. The large LED display improves visibility. Measurement information includes the threshold, current, resolution, and received light amount and is available with simple key operations. LCD screens can be customized to change the display of desired information to easier-to-understand terminology.



Mount to DIN Track or directly to control panels.



#### Set Sensing Directly Patent Pending

In FUN (setting) Mode, setting menus are displayed on the 2 rows of the LCD. Easy-to-understand guidance simplifies setting the many display capabilities of the LCD. Function keys correspond to displayed menu items for intuitive setting of measurement conditions and other parameters. You can also easily switch between Japanese and English displays. Communication with the operator is better than ever before.



#### Connect directly to a PC using USB.

USB 2.0 and RS-232C provided as standard features. LVDS, a new-generation digital high-speed communications interface, is used between the Sensor Head and Controller, an industry first. If USB is used to connect to the computer, high-speed all digital measurement data transfer is possible. Firmware can be updated easily using the SmartMonitor WarpEngine.





### **ZS-LDC** Single Task Controller

Simple Operation Reasonable Price

Panel Mounting Adapter (Option, Sold Separately)

## **Standard Sensors**

Standard

### ZS-L Series Product Lineup 2D CMOS Low-end Displacement Sensors

Advanced sensing technology packed into the smallest Sensor Heads in this class.



### Smart Sensor Advanced technology is carried

### Stable Measurements for PCBs, Black Resin, and Metal

All you need to do is select the proper mode to achieve stable sensing of PCBs, resins, black rubber, and other light-penetrating workpieces (these could not be easily handled with previous reflective laser displacement meters.)

#### ZS-LD80





Gain setting: 5 15.000 0 10.000 mm) 10 5.000 20 ight 0.000 - 30 ę -5.000 40 -10.000 -15 000 Number of data

Complete measurement data will be obtained at angles of up to 40°.

### ZS-LD50



PCB shapes can be measured without burs or waveform disruptions.

### Stable Measurements for Glass

Stably measure height and undulations in transparent, coated, or colored glass on work tables. Stable detection at 40 mm with a line beam of 2 mm.

A 2-mm line beam reduces the influence of black and white patterns on granite work tables to achieve stable measurements.



Ideal for measuring glass thickness and slit nozzle gaps when coating glass with resist or sealer.

#### Line Beam Sensors for Emphasis on Stable Measurement

Line beams produce an averaging affect that is less likely to be affected by surface irregularities, creating stable measurements.

Ideal for stable measurements that do not rely on the surface of the target workpiece.



# Spot Beam Sensors Ideal for Minute Workpieces and Shape Measurement

Ideal for measurements requiring minute shape repeatability while matching laser beam position with a minute target measurement area.



### Easy Sensing with an HMI That Couldn't Be Easier to Use

Just select High-precision Mode to stably measure black rubber.

Just select Penetration Mode to stably measure PCBs or black resin.

Set Sensing Directly





### System Configuration



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### Multi-Controller **ZS-MDC**

### Centralized Controller Information Calculations

Transfers data between multi-connected Controllers and performs high-speed multiprocessing.

#### High-speed Connections for Up To 9 Controllers

See the difference in applications requiring multipoint measurement, such as thickness, steps, and flatness measurements. Connect up to 9 Controllers with the fastest high-speed bus in the industry. Digital processing prevents data dropouts to provide the capability to measure exactly what is seen.

Sampling speed with 3 Controllers connected: 110 µs, Sampling speed with 9 Controllers connected: 380 µs Note: When using communications commands.



Controllers: 2 to 9

#### Processing Enabled by the Multi-Controller





Multipoint Thickness Calculations

Calculating the difference between pairs of points.

Number of Sensor

ASK1 = K – (A + B

**Reference Step Calculations** Calculating the difference between a reference point (A) and other points.

**Relative Step Calculations** 

**Twisting Calculations** 



Controllers: 3 Calculation: Task 1 = B - (A + C)/2



[K + mX + nY]



Multi-calculations of Data

Multipoint measurement

High-speed data transfer



### Data Storage Unit **zs-Dsu**

Logging Software for Onsite Installed



### Multipoint data collection

#### Traceability

#### Changeover Unit

Efficiently stores sensing data using a variety of logging functions.

High-speed, long term logging settings can be used to precisely process the required sensing data, which can be reliably and completely collected using USB and an all-digital bus. Sensor setting data can also be stored.

Data for up to 128 banks can be stored and transferred to the Master Unit for changeovers.

#### •High-speed sampling rate: 150 μs max.

\*1) For One-shot Mode

channels

Connected to ZS-LDC
 Number of Min.com

Min. sampling interval

150 µs

200 µs

350 µs

650 µs

Longest logging time

10 min

6.5 min

5.5 min

4.5 min

Typical examples

Powerful support for logging data using various trigger functions.

Config-	Number of connectable Controllers	10 max. (ZS-MDC: 1, ZS-HLDC/LDC: 9 max.)
uration	Connectable Controllers	ZS-HLDC , ZS-LDC , ZS-MDC
	Data resolution	32 bits
Perform- ance	Sampling rate	<ul> <li>Shortest high-speed logging mode (One-shot Mode) *1</li> <li>Long-term logging mode (Repeat Mode) *2</li> <li>Sampling period: 10 ms to 1 h (at 1-ms intervals)</li> </ul>
	Trigger functions	Start and end triggers can be set separately. External trigger/data trigger (self-trigger) Time triggers
Functions	Other functions	<ul> <li>External bank function</li> <li>Alarm output function</li> <li>Saved data format customization function</li> <li>Time function (timestamps)</li> </ul>
Software (included)		CSV file generation Software     Excel macros for simple analysis     (Equivalent to software provided with SmartMonitor Professional.)

\*2) For Repeat Mode (Logging time depends on capacity of Memory Card.)

<ul> <li>Example for 64-MB Memory Card</li> </ul>						
Number of channels	Min. sampling interval	Longest logging time				
1	10 ms	20 h				
2	10 ms	10 h				
4	10 ms	5 h				
9	10 ms	2 h				
Typical exampl						

#### Data Storage Unit (2S-DSU) CF Card CS S S S S S CS S S S S CR CHTCHING CR CHARLES CR CHA

Data Storage Unit

Connected to ZS-MDC						
lumber of channels	Min. sampling interval	Longest logging time				
1	350 µs	20 min				
2	400 µs	12 min				
4	500 µs	8 min				
9	700 µs	5 min				
Tunical avampla						

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### Setting Software for ZS Series SmartMonitor V3 Professional ZS-SW11V3E

Use a Computer for Everything from Ideal ZS Settings to Powerful Support of Data Collection and Analysis. Easy Settings Using USB.

#### More Powerful Setting Support

The CMOS light reception image and the received light waveform can be displayed. The real power of the SmartMonitor is seen when measuring transparent objects and other workpieces that create multiple received light waveforms.

Clear workpreces that create multiple received light waveform

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#### High-speed simultaneous multichannel waveform graphs.

High-speed display: 2-ms interval at max. speed (see note); Simultaneous multichannel waveform display: Up to 9 waveforms can be displayed.

Note: Data may be skipped, depending on the computer system. Use a computer that meets the recommended system requirements.





#### Meets a wide range of logging needs.

Log measurement results at various times to leave judgment and inspection results. The fastest sampling interval is 500  $\mu s$  (see note).

Note: Data may be skipped, depending on the computer system. Use a computer that meets the recommended system requirements.

#### Logging

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				2	3	4		

#### Excel macro provided for simple analysis.

Data collected by logging can be processed with an Excel macro using filters, slope compensation, filter median transitions, differentiation, integration, and arithmetic functions and then used for nominal judgments and other determinations.

Analysis



Recommended System Requirements SmartMonitor Professional

OS: Windows 10 (32-bit/64-bit version)

Windows 7 (32-bit/64-bit version)

Windows XP (Service Pack3 or higher, 32-bit version) CPU: Intel Pentium III 1 GHz or faster (2 GHz min. recommended.) Memory: 1 GB min.

- Available hard disk space: 50 MB min.
- Display screen:  $1,024 \times 768$  dots min., 16 million colors min.
- Note: If the recommended system requirements are not met, data may be interrupted and waveforms not displayed correctly when using the logging, high-speed graph drawing, and
  - multi-channel waveform drawing functions.

SmartAnalyzer Macro Edition

For Microsoft Excel Macro Programming Microsoft Excel 2000 or later required.

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# Ordering Information

#### **ZS-HL-series Sensor Heads**

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution (see note)	Cable length	Model
Regular 20±1 Reflective Models 25±2	20+1 mm	Lino boam	1.0 mm × 20 um	0.25	2 m	ZS-HLDS2T 2M
	20111111	Line beam	1.0 mm × 20 µm	0.25 µm	0.5 m	ZS-HLDS2T 0.5M
	05 · 0 mm	Line beem	0.0 mm v 45 um	0.6m	2 m	ZS-HLDS2VT 2M
	25±2 11111	Line Deam	2.2 mm x 45 µm	0.6 µm	0.5 m	ZS-HLDS2VT 0.5M
50: Diffuse 100	50 · 5 · mm	Linebeen	$1.0 \text{ mm}  imes 30 \ \mu \text{m}$	0.25 μm	2 m	ZS-HLDS5T 2M
	50±5 mm	Line Deam			0.5 m	ZS-HLDS5T 0.5M
	100.00	Linebeen	0.5 mm	1 µm	2 m	ZS-HLDS10 2M
	100±20 mm	Line beam	3.5 mm x 60 µm		0.5 m	ZS-HLDS10 0.5M
Models	600 · 050 mm		10 mm 0.0 mm		2 m	ZS-HLDS60 2M
	600±350 mm	Line beam	16 mm × 0.3 mm	δμm	0.5 m	ZS-HLDS60 0.5M
	4500 500	Line hereit	10	500	2 m	ZS-HLDS150 2M
	1500±500 mm	Line beam	40 mm × 1.5 mm	500 μm	0.5 m	ZS-HLDS150 0.5M

Note : Refer to the table of ratings and specifications for details.

#### ZS-HL-series Sensor Heads (For Nozzle Gaps)

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution (see note)	Cable length	Model
	10+0.5 mm	l ine beam	900 × 25 µm	0.25 μm	2 m	ZS-LD10GT 2M
Regular	10±0.5 mm	Line beam	500 × 25 μm		0.5 m	ZS-LD10GT 0.5M
Models	15+0 75 mm	Line beam	900 × 25 um	0.05	2 m	ZS-LD15GT 2M
modolo	15±0.75 mm	Line beam	900 × 25 μm	0.25 µm	0.5 m	ZS-LD15GT 0.5M

Note : Refer to the table of ratings and specifications for details.

#### **ZS-L-series Sensor Heads**

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution (see note)	Cable length	Model
		Lino boam	900 x 25 um	0.25 um	2 m	ZS-LD20T 2M
Regular	20+1 mm	Line beam	900 x 25 μm	0.25 µm	0.5 m	ZS-LD20T 0.5M
	20111111	Spothoom	25 um dia	0.25m	2 m	ZS-LD20ST 2M
Reflective		oporbeam	20 μπ σια.	0.20 µm	0.5 m	ZS-LD20ST 0.5M
wouers					4 m	ZS-LD40T 4M
	40±2.5 mm	Line beam	2000 × 35 μm	0.4 μm	2 m	ZS-LD40T 2M
					0.5 m	ZS-LD40T 0.5M
Diffuse		l ine beam	900 x 60 um	0.8 µm	2 m	ZS-LD50 2M
	50±5 mm	Eine beam	000 × 00 µm		0.5 m	ZS-LD50 0.5M
		Spot boom	50 um dia	0.8 µm	2 m	ZS-LD50S 2M
		Spot beam	50 µm uia.		0.5 m	ZS-LD50S 0.5M
	80±15 mm		900 × 60 μm	2 µm	2 m	ZS-LD80 2M
Beflective		Line beam			1 m	ZS-LD80 1M
Models					0.5 m	ZS-LD80 0.5M
	120+15 mm	Lino boam	600 x 70 um	3 um	2 m	ZS-LD130 2M
	130±13 mm	Line beam	000 x 70 µm	σμin	0.5 m	ZS-LD130 0.5M
	200 · 50 mm	Line beem	000 x 100 um	5 um	2 m	ZS-LD200 2M
	200±30 mm	Line beam	900 × 100 µm	0 µm	0.5 m	ZS-LD200 0.5M
	250 · 125 mm	Spothoom	240 um dia	20 um	2 m	ZS-LD350S 2M
	330±135 mm	Sporbeam	240 µm dia.	20 µm	0.5 m	ZS-LD350S 0.5M

Note : No. of samples to average: 128 when set to High-precision Mode.

#### **ZS-HL-series Sensor Controllers**

Shape	Supply voltage	Control outputs	Model
- 288888 - 388888	24 VDC	NPN outputs	ZS-HLDC11
	24 000	PNP outputs	ZS-HLDC41

#### **ZS-L-series Sensor Controllers**

Shape	Supply voltage	Control outputs	Model
20000		NPN outputs	ZS-LDC11
	24 VDC	PNP outputs	ZS-LDC41

#### Multi-Controllers

Shape	Supply voltage	Control outputs	Model
		NPN outputs	ZS-MDC11
(MARK 4 was	24 VDC	PNP outputs	ZS-MDC41

#### Data Storage Units

Shape	Supply voltage	Control outputs	Model
7255585		NPN outputs	ZS-DSU11
	24 VDC	PNP outputs	ZS-DSU41

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#### Accessories (Sold Separately)

Controller Link Unit

Shape	Model
al and	ZS-XCN

#### Panel Mount Adapter

Shape	Model		
	ZS-XPM1	For 1st Controller	
	ZS-XPM2	For expansion (from 2nd Controller on)	

#### RS-232C Cables

Connected to	Model	Qty
Personal computer (2 m)	ZS-XRS3	1
PLC/PT (2 m)	ZS-XPT3	1

#### Extension Cables for Sensor Heads

Cable length	Model	Qty			
1 m	ZS-XC1A	1			
4 m	ZS-XC4A	1			
5 m	ZS-XC5B (*1, *2)	1			
8 m	ZS-XC8A	1			
10 m	ZS-XC10B (*1)	1			

\*1. Up to two ZS-XC B Cables can be connected. (22 m max.)

\*2. A Robot Cable (ZS-XC5BR) is also available.

#### Long Extension Cables for Sensor Heads (Used with a Digital Equalizer for ZS-HL Series)

Name	Model	Qty
Digital Equalizer (Relay)	ZS-XEQ	1
Extension Cable (long distance, flexible 15 m cable)	ZS-XC15CR	1
Extension Cable (long distance, flexible 25 m cable)	ZS-XC25CR	1
Digital Equalizer Connection Cable (0.2 m)	ZS-XC02D	1

#### Logging Software

00 0	
Name	Model
SmartMonitor Professional	ZS-SW11V3E

#### Realtime Parallel Output Unit (for ZS-HL Series)

Shape	Control outputs	Model
	NPN outputs	ZG-RPD11-N
$\overline{\mathbb{O}}$	PNP outputs	ZG-RPD41-N

CompoNet-compatible Sensor Communications Unit.

Shape	Model
	ZS-CRT

#### Memory Cards

Model	Capacity
HMC-EF283	256 MB
HMC-EF583	512 MB

#### Quick Reference for Extension Cable Connections

E	Extension Cable		Senso	Sensor Head		troller	Davida
Model	Length	Bend resistant	ZS-LD⊡ ZS-HLDS2V	ZS-HLDS2/ -HLDS5/-HLDS10/ -HLDS60/-HLDS150	ZS-LDC□	ZS-HLDC□	Hemarks
ZS-XC1A	1m		0	0	0	0	
ZS-XC4A	4m		0	0	0	0	Only one Extension Cable can be used.
ZS-XC8A	8m		0	0	0	0	
ZS-XC5B	5m		0	0	0	0	Up to two Extension Cables can be used
ZS-XC10B	10m		0	0	0	0	(The maximum length is 22 m.)
ZS-XC5BR	5m	0	0	0	0	0	
ZS-XC15CR	15m	0		0		0	A ZS-XEQ Digital Equalizar and ZS-XC02D
ZS-XC25CR	25m	0		0		0	Digital Equalizar Connecting Cable are requied.

### **Ratings and Specifications**

#### ZS-HL/L-series Sensor Controllers

Item		Model	ZS-HLDC11/LDC11 ZS-HLDC41/LDC41		
No. of samples to av	No. of samples to average		1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096		
Number of mounted	Number of mounted Sensors		1 per Sensor Controller		
Connection method			Serial I/O: connector, Other: pre-v	vired (Standard cable length: 2 m)	
	Sorial I/O	USB 2.0	1 port, Full Speed (12	2 Mbps max.), MINI-B	
	Serial I/O	RS-232C	1 port, 115,2	200 bps max.	
		Judgment	HIGH/PASS/LOW 3 outputs	HIGH/PASS/LOW: 3 outputs	
External interface		output	NPN open collector, 30 VDC, 50 mA max., residual voltage 1.2 V max.	PNP open collector, 50 mA max., residual voltage 1.2 V max.	
External interface	Output	Lincor	Selectable from 2 types of output, voltage or current (selected by slide switch on bottom).		
		output	Voltage output: -10 to 1	10 V, output impedance: 40 $\Omega$	
			Current output: 4 to 20	mA, maximum load resistance: 300 $\Omega$	
	landa	Laser OFF, ZERO reset timing,	ON: Short-circuited with 0 V terminal or 1.5 V or less	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage.	
	inputs	RESET	OFF: Open (leakage current: 0.1 mA max.)	OFF: Open (leakage current: 0.1 mA max.)	
Functions			Display:       Measured value, threshold value, voltage/current, received light amount, and resolution/terminal block output *2         Sensing:       Mode, gain, measurement object, head installation         Measurement point *1:       Average, peak, bottom, thickness, step, and calculations         Filter:       Smooth, average, and differentiation         Outputs:       Scaling, various hold values, and zero reset         I/O settings:       Linear (focus/correction), judgments (hysteresis and timer), non-measurement, and bank (switching and clear) *2         System:       Save, initialization, measurement information display, communications settings, key lock, language, and data load         Task:       ZS-HLDC_11: Single task		
Status indicators			HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (orange), and ENABLE (green)		
Segment display		Main digital	8-segment red LED, 6 digits		
ocyment display		Sub-digital	8-segment green LEDs, 6 digits		
LCD		1	16 digits x 2 rows, Color of characters: greer	n, Resolution per character: 5 x 8 pixel matrix	
Sotting inputs		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)		
		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)		
Power supply voltage	е		21.6 V to 26.4 VD	C (including ripple)	
Current consumption			0.5 A max. (when Sensor Head is connected)		
Ambient temperature			Operating: 0 to 50°C, Storage: -15 to +60°C (with no icing or condensation)		
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)		
Degree of protection			IP20 (IEC60529)		
Materials			Case: Polycarbonate (PC)		
Cable length			2 m		
Weight			Approx. 280 g (excluding packing materials and accessories)		
Accessories			Ferrite core (1), instruction sheet		

\*1. Can be used with ZS-HLDC□1 when Multitask Mode selected. \*2. Terminal block output is a function of the ZS-HLDC□1.

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### **Ratings and Specifications**

#### **ZS-HL-series Sensor Heads**

Item Model		ZS-HL	.DS2T	ZS-HLDS2VT	ZS-H	ZS-HLDS5T		_DS10	ZS-HLDS60	ZS-HLDS150	
Applicable Contro	ollers	ZS-HLDC series									
Optical system		Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Diffuse reflection	
Measuring center	distance	20 mm	5.2 mm	25 mm	50 mm	44 mm	100 mm	94 mm	600 mm	1500 mm	
Measuring range		±1 mm	±1 mm	±2 mm	±5 mm	±4 mm	±20 mm	±16 mm	±350 mm	±500 mm	
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2) Visible semiconductor laser (wavelength: 658 nm, 1 mW max.)								gth: 658 nm, 1 mW max., JIS Class 2)	
Beam shape							Line beam				
Beam diameter *	1	1.0 mm ×	< 20 μm	2.2 mm × 45 μm	1.0 mm × 30 μm		$3.5~\text{mm}  imes 60~\mu\text{m}$		16 × 0.3 mm (at 500 mm)	40 × 1.5 mm (at 1,500 mm)	
Linearity *2		±0.05	%F.S.	±0.2%F.S.		±0.19	%F.S.		±0.07%F.S. (250 to 750 mm), ±0.1%F.S. (750 to 950 mm)	±0.2%F.S.	
Resolution *3		0.25 μm (No. of sampl	les to average: 256)	0.6 µm (No. of samples to average: 128)	0.25 μm (No. of san	nples to average: 512)	1 μm (No. of samp	oles to average: 64)	8 μm (No. of samples to average: 64 at 250 mm), 40 μm (No. of samples to average: 64 at 600 mm)	500 µm (No. of samples to average: 64)	
Temperature char	racteristic *4	0.01%F	.S./°C	0.1%F.S./°C	0.01%F.S./°C						
Sampling cycle		110 μs (High-speed Mode), 500 μs (Standard Mode), 2.2 μs (High-precision Mode), 4.4 μs (High-sensitivity Mode)									
		Lights near the measuring center distance, and closer than the measuring center distance inside the measuring range.									
LED Indicators	NEATTINGCalor	Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
	FAR indicator	Lights near the measuring center distance, and farther than the measuring center distance inside the measuring range.									
Operating ambier	nt illumination	Illumination on received light surface: 3000 lx or less (incandescent light)									
Ambient temperat	ture	Operating: 0 to 50°C, Storage: -15 to 60°C (with no icing or condensation)									
Ambient humidity	,	Operating and storage: 35% to 85% (with no condensation)									
Degree of protect	tion *5	IPe	64	IP67	Cable	length 0.5 m: IP66, c	able length 2 m: IP6	57	IP66 *6		
Materials		Case: Aluminum die-cast, Front cover: Glass									
Cable length		0.5 m	, 2 m	2 m				0.5 m	m, 2 m		
Weight			Approx. 350 g				Approx. 600 g		Approx. 800 g		
Accessories		Laser labels (1 each for JIS ferrite cores (4), insure lock	S/EN, 3 for FDA), ks (2), instruction sheet	Laser labels (1 each for JIS/EN), ferrite cores (2), insure locks (2), instruction sheet	Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (4), insure locks (2), instruction sheet					leet	

\*1. Defined as 1/e2 (13.5%) of the center optical intensity at the actual measuring center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.

\*2. This is the error in the measured value with respect to an ideal straight line. Linearity may change according to the workpiece.

The following options are available.

Model	Diffuse reflection	Mirror reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS2VT		Glass
ZS-HLDS5T	White alumina ceramic	Glass
ZS-HLDS10	White alumina	ceramic
ZS-HLDS60/HLDS150	White alumina ceramic	

\*3. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to within the graph. The maximum resolution at 250 mm is also shown for the ZS-HLDS60. The following options are available.

 Model
 Diffuse reflection
 Mirror reflection

 ZS-HLDS2T
 SUS block
 Glass

 ZS-HLDS2VT
 --- Glass

 ZS-HLDS5T
 White alumina ceramic
 Glass

 ZS-HLDS10
 White alumina ceramic
 East

 ZS-HLDS60/HLDS150
 White alumina ceramic
 ---

- \*4. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig. (typical example)
- \*5. Protection structure of connector area is IP40.
  \*6. Ask your OMRON representative about Sensor Heads with
- \*6. Ask your OMHON representative about Sensor Heads with IP67 protection.

### **Ratings and Specifications**

#### ZS-L-series Sensor Heads

Item Model		ZS-LD20T ZS-LD20ST				ZS-L	D40T	ZS-LD10GT	ZS-LD15GT		
Applicable Contro	ollers	ZS-HLDC/LDC Series									
Optical system		Regular reflection	Diffuse reflection	Regular reflection Diffuse reflection Regular reflection Diffuse reflection				Regular reflection			
Measuring center	distance	20 mm	6.3 mm	20 mm	6.3 mm	40 mm 30 mm		10 mm	15 mm		
Measuring range		±1 mm	±1 mm	±1 mm	±1 mm	±2.5 mm	±2 mm	±0.5 mm	±0.75 mm		
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)									
Beam shape		Line I	beam	Spot	beam			Line beam			
Beam diameter *1	1	900 × 1	25 μm	25 μr	n dia.	2000 ×	35 µm	Approx. 25	5 × 900 μm		
Linearity *2						±0.1%	% FS				
Resolution *3		0.25	0.25 μm 0.25 μm		iμm	0.4 μm		0.25 μm	0.25 μm		
Temperature char	acteristic *4	0.04%	FS/°C 0.04% FS/°C			0.02% FS/°C		0.04% FS/°C			
Sampling cycle		110 μs (High-speed Mode), 500 μs (Standard Mode), 2.2 ms (High-precision Mode), 4.4 ms (High-sensitivity Mode)									
	NEAD indicator	Lights near the measuring center distance, and closer than the measuring center distance inside the measuring range.									
LED Indicators	NEAR Indicator	Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
LED Indicators	FAR indicator		Lights near the measuring center distance, and farther than the measuring center distance inside the measuring range.								
		Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
Operating ambien	nt illumination	Illumination on received light surface: 3000 lx or less (incandescent light)									
Ambient temperat	ture	Operating: 0 to 50°C, Storage: -15 to 60°C (with no icing or condensation)									
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)									
Degree of protection *5		Cable length 0.5 m: IP66, cable length 2 m: IP67 IP40									
Materials		Case: Aluminum die-cast, Front cover: Glass									
Cable length		0.5 m, 2 m									
Weight		Approx. 350 g Approx. 400 g									
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (2), insure locks (2), instruction sheet Laser safety labels (1 each for JIS/EN), ferrite cores (2), insure locks (2)							N), ferrite cores (2), insure locks (2)		

\*1. Defined as 1/e<sup>2</sup> (13.5%) of the center optical intensity at the actual measuring center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.

\*2. This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics and glass in the regular reflection mode. Linearity may change according to the workpiece.

\*3. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics and glass in the regular reflection mode.

\*4. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig. (typical example)

\*5. Protection structure of connector area is IP40.

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**Smart Sensor** 

### **Ratings and Specifications**

#### ZS-L-series Sensor Heads

Item	Item Model		ZS-LD50 ZS-LD50S			ZS-LD80 ZS-LD130			ZS-L	D200	ZS-LD350S		
Applicable Cont	trollers		ZS-HLDC/LDC Series										
Optical system		Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	
Measuring cent	er distance	50 mm	47 mm	50 mm	47 mm	80 mm	78 mm	130 mm	130 mm	200 mm	200 mm	350 mm	
Measuring range		±5 mm	±4 mm	±5 mm	±4 mm	±15 mm	±14 mm	±15 mm	±12 mm	±50 mm	±48 mm	±135 mm	
Light source			Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)										
Beam shape		Line I	beam	Spot	beam	Line I	beam	Line beam		Line beam		Spot beam	
Beam diameter	*1	900 ×	60 µm	50 μr	n dia.	900 ×	60 µm	600×	70 µm	$900 \times 100 \ \mu\text{m}$		240 µm dia.	
Linearity *2 ±0	.1% FS		±0.1% FS						±0.25% FS	±0.1% FS	±0.25% FS	±0.1% FS	
Resolution *3		0.8	μm	0.8 μm		2 µm		3 μm		5 μm		20 µm	
Temperature ch	aracteristic *4	0.02%	FS/°C	0.02%	FS/°C	0.01% FS/°C		0.02%	FS/°C	0.02% FS/°C		0.04% FS/°C	
Sampling cycle			110 μs (High-speed Mode), 500 μs (Standard Mode), 2.2 ms (High-precision Mode), 4.4 ms (High-sensitivity Mode)										
		Lights near the measuring center distance, and closer than the measuring center distance inside the measuring range.											
LED Indicators	NEAR Indicator	Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.											
	EAD indicator	Lights near the measuring center distance, and farther than the measuring center distance inside the measuring range.											
	Antinuicator	Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.											
Operating ambi	ent illumination	Illumination on received light surface: 3000 lx or less (incandescent light) Illumination on received light surface: 2000 lx or less (incandescent light) Illumination on received light surface: 3000 lx or less (incandescent light)										: 3000 lx or less (incandescent light)	
Ambient temper	rature	Operating: 0 to 50°C, Storage: -15 to 60°C (with no icing or condensation)											
Ambient humidi	ty	Operating and storage: 35% to 85% (with no condensation)											
Degree of prote	ction *5	Cable length 0.5 m: IP66, cable length 2 m: IP67											
Materials		Case: Aluminum die-cast, Front cover: Glass											
Cable length		0.5 m, 2 m											
Weight							Approx. 350g						
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (2), insure locks (2), instruction sheet											

\*1. Defined as 1/e<sup>2</sup> (13.5%) of the center optical intensity at the actual measuring center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.

\*2. This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics and glass in the ZS-LD50/LD50S regular reflection mode. Linearity may change according to the workpiece.

\*3. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode.

The standard workpiece is white aluminum ceramics and glass in the ZS-LD50/LD50S regular reflection mode.

\*4. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.

\*5. Protection structure of connector area is IP40.

### **Ratings and Specifications**

#### ZS-MDCD1 Multi-Controllers

Basic specifications are the same as those for the ZS-LDC I Sensor Controllers. The following points, however, are different. 1. Sensor Heads cannot be connected.

- 2. Control Link Units are required to connect up to 9 Controllers. Control Link Units are required to connect Controllers.
- 3. Processing functions between Controllers: Arithmetic functions

#### Controller Link Units





#### ZS-DSUD1 Data Storage Unit

Item Model			ZS-DSU11	ZS-DSU41				
Number of mounted	Sensor Heads		Cannot be connected					
Number of connectable Controllers			10 max. (ZS-MDC: 1, ZS-HLDC/LDC: 9 max.) *1					
Connectable Controllers								
	Connection method		Serial I/O: connector, Other: pre-wired (standard cable length: 2 m)					
	Seriel I/O	USB 2.0	1 port, Full Speed (12 Mbps max.), MINI-B					
External interface	Senar I/O	RS-232C	1 port, 115,2	200 bps max.				
	Output		3 outputs: HIGH, PASS, and LOW; NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW; PNP open-collector, 50 mA max., residual voltage: 1.2 V max.				
	Inputs		ON: Short-circuited with 0 V terminal or 1.5 V or less; OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage; OFF: Open (leakage current: 0.1 mA max.)				
Data resolution			32	bits				
Functions	Logging trigger functi	ons	Start and stop triggers can be set separately; external triggers, data triggers (self-triggers), and time triggers					
Functions	Other functions		External banks, alarm outputs, saved data format customization, and clock					
Status indicators			OUT (orange), PWR (green), ACCESS (orange), and ERR (red)					
Segment display			8-segment green LEDs, 6 digits					
LCD			16 digits x 2 rows, Color of characters: green, Resolution per character: 5 × 8 pixel matrix					
Catting insula		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)					
Setting inputs		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)					
Power supply voltage	<u>;</u>		21.6 V to 26.4 VDC (including ripple)					
Current consumption	l		0.5 A max.					
Ambient temperature	)		Operating: 0 to 50°C, Storage: 0 to 60°C (with no icing or condensation)					
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)					
Degree of protection			IP20 (IEC60529)					
Materials			Case: Polycarbonate (PC)					
Weight			Approx. 280 g (excluding pack	ing materials and accessories)				
Accessories			Ferrite core (1), instruction sheet for Data Storage Unit: CSV File Converter for Data Storage Unit/Smart Analyzer Macro Edition					

\*1. Control Link Units are required to connect Controllers.

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### Dimensions

Sensor Controllers ZS-HLDC 1/LDC 1



### **Dimensions**



# Ratings and Specifications



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### Dimensions





#### Sensor Heads



#### ZS-HLDS2VT/LD20T/LD20ST/LD40T



### Dimensions

#### Realtime Parallel Output Unit



#### Panel Mount Adapter

ZS-XPM1/XPM2 (Dimensions for Panel Mounting)



# Ratings and Specifications

#### **Digital Equalizer** ZS-XEQ









15°<sup>+1°</sup>

°+0

15°<sup>+1</sup>

ŝ





(Unit: mm)

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#### Safety Precautions for Using Laser Equipment

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Do not expose your eyes to the laser radiation either directly or indirectly (i.e., after reflection from a mirror or shiny surface). The laser radiation has a high power density and exposure may result in loss of sight. Laser Label Indications Attach the following warning label to the side of the ZS series Sensor Head.



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This document provides information mainly for selecting suitable models. Please read the manual carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

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